in their original shape, cannot be determined. Brahmagupta's edition of the above was called "The Brahma Sphuta Siddhanta," "Sphuta" meaning "amended" or "corrected" (perhaps "restored" would be better). Colebrooke translated two chapters of this from the Sanskrit. They are chiefly mathematical, giving methods for performing trigonometrical, geometrical, and algebraical questions. It should be mentioned that the four principal Siddhantas are reputed by the Hindus to have been inspired; the Brahma Siddhanta having been, they say, revealed by Brahma, the Surya Siddhanta by the sun, the Soma Siddhanta by the moon, and the Brihaspati Siddhanta by Jupiter. Mr. Brennand gives a very particular description of the Surya (or sun) Siddhanta, but we can mention only a few points to which he calls attention. The ancient cycle of sixty years, common to the Chaldæans, the Chinese, and the Hindus, consisted, in fact, of five periods of the planet Jupiter round the sun. As regards the planetary motions, they were all supposed to be of uniform velocity in themselves, though some appeared to move more slowly than others, on account of their greater distances. The Brahmins approximated very closely to the true length of a year. Mr. Brennand devotes a very considerable space to a description of their methods of astronomical calculation, which are worthy of careful study; but we must now conclude this short sketch of his interesting work by reiterating his own hope that his book may lead to further investigations on the subject.

W. T. LYNN.

AMBER IN SCIENCE AND THE ARTS.

The Tears of the Heliades; or, Amber as a Gem. By W. Arnold Buffam. Pp. 98, 8vo; with illustrations. (London: Sampson Low, Marston, and Co., Ltd., 1896.)

THAT the classical account of the origin of amber has not been sufficiently practical to satisfy modern inquirers, is proved by the interest that has always been attached to the subject, and more especially in recent years. The wide geographical range over which this fossil resin is now found, and the different conditions of the several deposits, has increased the interest and speculation with regard to the number and character of the trees or plants from which the resin exuded in long past ages; but speculation has of late been largely converted into fact by the systematic study of a mass of material that has been carefully examined by Dr. H. R. Goeppert and A. Menge, and more recently by Dr. H. Conwentz.

Goeppert and Menge's "Die Flora des Bernsteins," published at Dantzig in 1883, is, moreover, illustrated by a number of splendidly executed coloured plates, showing not only lumps of amber of different formation, but also sufficient material of wood structure to prove certain botanical affinities, and of floral and leaf-forms found in masses of the fossil resin.

In Dr. H. Conwentz's contribution to this subject, published at Dantzig in 1886, the plants referred to are arranged in their natural orders, commencing with the monocotyledons. This is also illustrated by a fine series of plates. Dr. Conwentz further published—at Dantzig in 1890—a "Monographie der Baltischen Bernsteinbäume," and at the Ipswich meeting of the British Association in 1895 gave a very valuable address "On English amber and amber generally," and as this paper was printed in *Natural Science* (vol. ix. Nos. 54 and 55, for August and September last), it may certainly be regarded as the best contribution in the English language to this interesting subject.

Though Mr. Buffam in his "Tears of the Heliades" devotes one chapter of twenty-four pages to the consideration of the plants furnishing amber, and their geographical distribution, he does not seem to have been acquainted with Dr. Conwentz's researches. The two authors, however, have been working on different lines. Dr. Conwentz in his paper has paid special attention to English amber and to the sources of amber particularly, while Mr. Buffam has treated his subject, as one of his titles indicates, from an artistic point of view, and in this we must say he has succeeded in making a most charming book. His description of the Sicilian amber shows at once that his admiration of the gem amounts to enthusiasm, and in this the reader is almost carried away with the same enthusiasm with such paragraphs as the following description of a gold and amber necklace which he saw on the neck of an Italian girl.

> "Whilst she spoke," he says, "the gems in her necklace flashed in the sunlight, showing colour shades ranging from faint blue to deepest azure, and from pale rose to intense pigeon-blood, ruby red. The varied and lustrous hues here blended in lavish beauty drew from me involuntary expressions of admiration."

The beauty of these gems is further impressed on the reader's admiration by an excellent reproduction in colours and gold, forming the frontispiece to the book; gems such as these, however, it is stated are rare even in Sicily. Sicilian amber, we are told—

> "is only found on or near the surface of the ground in an accidental manner, scattered over a wide extent of country, having been transported by down-pouring rains and by brooks and rivers far from its primary bed, which is believed to be in the neighbourhood of the Central Mountains, where Gemmellaro and Maravigna, in fact, affirmed its existence."

It is not necessary to dilate here on the general uses of amber, such as for mouthpieces of pipes, beads, brooches, &c., as this has been exhaustively treated of by nearly all writers on the subject; but the bulk of the amber of commerce is the yellow kind obtained in such large quantities from the Baltic. It may, however, be as well to refer to its early use in medicine, and on this head Mr. Buffam says:—

> "The ancients employed amber as a medicine, and it is still prescribed by physicians in France, Germany and Italy, and several chemists in Paris keep it constantly in stock. It has been worn by ladies and children from time immemorial as an amulet, sometimes carved into amphoræ, and has been pronounced of service either taken internally or worn round the neck."

It is remarkable that the resin should still be used on the continent as a medicine, as stated by Mr. Buffam, for though it formerly had a reputation as a stimulant and antispasmodic in England, it has been discarded by us for at least forty or fifty years as possessing no medicinal properties.

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As a material for varnish making, amber was a recognised commercial article in the sixteenth century. Whether it was the basis of the varnish used by the old violin makers has long been a disputed question, which can never be satisfactorily settled. It is not improbable that the peculiar electric qualities possessed by amber may have exercised some influence in producing the marvellous tones of the violins of the old masters; and the extremely dangerous and difficult task of melting amber in either fixed or volatile oils, on account of its liability to fire under heat, would preclude any attempt at its manufacture except in the laboratory and under personal superintendence, so that the secret of its preparation died with each master.

On the other hand, the danger and difficulty attending the melting of the substance has been advanced as a reason against the probability of its use. As a modern varnish material, amber is now scarcely in demand. With regard to English amber, though specimens are not unfrequently found on the Norfolk, Suffolk, and Essex coasts, as stated by Dr. Conwentz, there has been some doubt as to the genuine character of some of the pieces, which appear to have been copal or anime rather than true amber. The similarity in the formation of the two resins is borne out by an illustration of concentric structure given by Dr. Conwentz in his valuable paper before alluded to, with a specimen of Demerara copal from the locust tree (*Hymenæa Courbaril*) in the Kew Museum.

JOHN R. JACKSON.

THE RED DEER.

Fur and Feather Series: Red Deer. Natural History, by Rev. H. A. Macpherson; *Stalking*, by Cameron of Lochiel; *Hunting*, by Viscount Ebrington; *Cookery*, by A. I. Shand. Pp. viii + 320. 12mo, illustrated. (London: Longmans, Green, and Co., 1896.)

ALL contributions to the natural history of the finest of our British mammals cannot fail to be interesting to all with a zoological turn of mind; while accounts of the stalking and chase of the same noble animal will command attention from a still wider circle of readers. Whether the three chapters which Mr. Macpherson contributes to the little work before us form an adequate account of the natural history of *Cervus elaphus*, may be a moot point, but to our mind they are too "parochial." There is, for instance, nothing said as to the distribution of the red deer, or its relations to other members of the same genus; and the chief attention is directed to its breeding-habits. The author of these chapters appears to derive most of his knowledge of the animal from the Lake District; and the first chapter is nothing more than a description and history of the fells of Westmoreland, with some casual observations on red deer thrown in. It is written in a pleasant and gossipy style, but as its purport has already appeared in the pages of "Lakeland," its reproduction here seems superfluous. The third chapter in the natural history section is entitled "Echoes of the Chase," and would more appropriately have come in Lord Ebrington's section.

Indeed, the work decidedly suffers from insufficient editing. For instance, most of Lord Ebrington's very interesting remarks on antlers, in the chapter entitled "Deer," should clearly find a place in the natural history portion. Again, after Mr. Macpherson had written, on page 34, that "Deer, by the way, are very fond of nibbling the remains of shed antlers," the editor ought not to have permitted the following sentence, by Lord Ebrington, to appear on page 278.

"I have never heard any explanation that accounted for this [the rarity of the discovery of the bodies of dead deer] satisfactorily, for the hinds would not eat carrion, though there seems little doubt that they will eat both bones and shed horns."

Either the matter is, or is not, a certainty, and one allusion would suffice.

So far as we are capable of judging, the chapters on stalking and hunting form admirable and interesting accounts of these sports. In addition to the remarks on antlers already mentioned, Lord Ebrington gives us many interesting observations which might well find a place in works on natural history. In reference to the "gait" and "slot," he writes that—

"A stag's dew-claws point outward, and are large in proportion to his own size, while a hind's are small, turn inward, and point straight down. A stag crosses his legs right and left in walking, while with a hind the prints of the hind foot will be in a direct line with those of the fore foot, unless she is heavy in calf. . . . The extra weight on the legs is no doubt the reason, and at calving time the stags are defenceless too, having shed their horns. The stag moves with more confidence than the hind, so his paces are regular. The hind moves femininely and distrustfully; sometimes she will put her hind feet down in front of the spot from where she has just lifted her fore ones, sometimes on the same spot, sometimes behind it."

Unless we are greatly mistaken, there are few professed naturalists who could have given such details; and yet they are surely of much more interest than the endless multiplication of species.

The illustrations are charming works of art, and the volume must claim a place in the library of every sportsman, if not of the naturalist also.

R. L.

OUR BOOK SHELF.

The Tutorial Chemistry. Part I. *Non-Metals.* By G. H. Bailey, D.Sc., Ph.D. Pp. viii + 226. (London: W. B. Clive, 1896.)

Elementary Non-Metallic Chemistry. By S. R. Trotman, M.A. Pp. viii + 183. (London: Rivington, Percival, and Co., 1896.)

IF the publication of text-books is a sign of increased attention to the branches of science with which they deal, chemistry must be making great progress; for no week, and scarcely a day, passes without the receipt of a manual for chemical students. The two volumes now before us are fair representatives of a class of text-books designed to furnish boys with the facts which examiners periodically endeavour to entice from them.

Dr. Bailey's book furnishes a systematic outline of chemistry, so far as it relates to the non-metals. Acting upon the conviction that a knowledge of physical principles and measures should be gained from an elementary text-book of physics, Dr. Bailey has omitted the preliminary chapters usually devoted to these matters, notwithstanding the growth of opinion that experiments and measurements of physical properties of matter form the best basis for a chemical education. He does not, however, ignore the physics of chemistry altogether, for a chapter is devoted to the physical properties of gases.

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